

**UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF OKLAHOMA**

RICHARD GLOSSIP, <i>et al.</i> ,)	
)	
Plaintiffs,)	
)	
vs.)	Case No. CIV-14-665-F
)	
RANDY CHANDLER, <i>et al.</i> ,)	
)	
Defendants.)	

EXPERT REPORT OF MARK A. EDGAR, M.D.

I. BACKGROUND AND EXPERT QUALIFICATIONS

A. Summary of Education and Professional Experience

1. My name is Mark A. Edgar, M.D. I am a practicing, Board-certified anatomic pathologist and neuropathologist, with a subspecialty in bone and soft tissue pathology. I am a Senior Associate Consultant in the Department of Laboratory Medicine and Pathology at Mayo Clinic Jacksonville, Florida and an Associate Professor of pathology at Mayo Clinic College of Medicine and Science. My professional qualifications and experience are fully set forth in my curriculum vitae appended to this report as Exhibit 1.

2. In my practice, I routinely conduct autopsies. I also routinely consult with other pathologists to evaluate cases from their subspecialty. I diagnostically evaluate biopsies and surgical specimens, including organs removed from patients during surgery, and I collaborate with other pathologists, orthopedic surgeons, and musculoskeletal radiologists in conducting research relevant to my area of specialty. I am also currently involved in the training of surgical pathology fellows, and occasionally I teach residents and medical students. Previously, I was the Director of Quality Assurance for Anatomic Pathology at Memorial Sloan-Kettering Cancer Center and at Emory University's Division of Anatomic Pathology, a position that required me to review and evaluate other pathologists' work. I have published more than 80 academic works regarding various aspects of anatomic pathology, including book chapters and original articles.

3. The factual statements I make in this report are true and correct to the best of my knowledge and experience. The opinions I express are stated to a reasonable degree of medical and scientific certainty unless otherwise noted.

B. Prior Expert Testimony

4. I have testified as an expert witness in two cases in the last four years:

- *Abdur'Rahman v. Parker*, Chancery Court for State of Tennessee, Twentieth Judicial District, Davidson County, TN, Part III, Case No. 18- 183-II (III). I served as an expert witness for the plaintiffs. I provided deposition and trial testimony.
- *In Re: Ohio Execution Protocol Litigation*, United States District Court for the Southern District of Ohio, Case No. 2:11-cv-1016. I served as an expert witness for the plaintiffs. I prepared an expert declaration and

provided testimony at trial.

C. Compensation

5. I am being compensated at the rate of \$400 per hour.

II. ASSIGNMENT AND MATERIALS CONSIDERED

6. I was asked by counsel representing Plaintiffs (other than Wade Lay) to render an opinion on the pathological effects of a 500 mg dose of midazolam administered as part of the Oklahoma Department of Corrections' execution protocol.

7. In preparing this report and reaching the expert opinions contained herein I have considered the following information and materials:

- The Oklahoma Department of Corrections Execution Protocol, OSP Policy No. OP-040301.
- Autopsy reports of 31 inmates executed using lethal injection protocols employing midazolam. A chart listing the names of these inmates and the autopsy findings is attached as Exhibit 2; the autopsy reports are attached as Exhibits 3-33.
- An autopsy I performed on Robert Van Hook, including microscopic analysis of tissue samples taken from Mr. Hook's body. The autopsy report of my findings is attached as Exhibit 34.
- A chart of eyewitness accounts of executions using midazolam lethal injection protocols. The chart is attached as Exhibit 35.
- Scientific and other medical publications cited throughout this report. A list of these publications is attached as Exhibit 36 and the publications are attached as Exhibits 39-41.

- The package insert for injectable midazolam. (Package inserts are documents included within the packaging of FDA-approved drugs that provide prescribing and safety information to health care professionals and patients based on information compiled and distributed by the drug manufacturer after FDA review and approval.) The package insert is attached as Exhibit 38.
- Court opinions and pleadings from *Abu-Ali-Abur'Rahman et al. v. Parker* (Tennessee Chancery Court, No. 18-183-II(III)), *In re Ohio Execution Protocol Litigation* (S.D. Ohio No. 2:11-cv-1016, 2017), *Glossip v. Gross*, and *Baze v. Rees*. A list of these documents is attached as Exhibit 37 and the documents are attached as Exhibits 42-49.

III. SUMMARY OF OPINIONS

8. Autopsies are conducted for a variety of reasons, but most commonly to establish a cause of death. Autopsies are also conducted to evaluate the extent of disease, to determine the cause of unexplained clinical findings, as a quality of assurance measure and for the training of pathology residents.

9. A complete autopsy involves the removal of all organs from the chest cavity and abdomen and the removal of the brain and spinal cord from the cranial cavity and spinal column, respectively. Organs, including the lungs, are individually weighed and examined with the naked eye for evidence of abnormality. If areas of abnormality are found, tissue is typically sampled from those areas. Sometimes, but not always, tissue samples are taken from organs that appear normal in order to detect diseases or conditions that may only be recognized during a microscopic evaluation. Lungs are assessed for a

variety of abnormalities, including pulmonary edema, by observing the cut surface (microscopically and with the naked eye) and by squeezing the tissue.

10. As discussed in detail below, I reviewed the autopsy reports of 31 prisoners executed using a drug protocol that included a large dose of midazolam. These autopsies were conducted by independent forensic pathologists. In addition, I personally performed the autopsy of Robert Van Hook, a prisoner who was executed using midazolam, a paralytic and potassium chloride. In these 32 autopsies, I noted consistent and repeated instances of pulmonary edema, which is defined below. The pulmonary edema documented was acute, meaning onset was sudden, and often severe.

11. The evidence from these 32 autopsies demonstrates that the acute pulmonary edema found in autopsies of the executed prisoners was attributable to the large doses of IV-injected midazolam. Based on my analysis of the available data, including personal experience conducting the Van Hook autopsy and the scientific literature and research cited in this report, it is my opinion that a prisoner who is executed using Oklahoma's three-drug execution protocol will develop acute pulmonary edema as a result of the IV injection of 500 mg of midazolam.

IV. BACKGROUND AND DISCUSSION

A. Pulmonary Edema

12. Pulmonary edema is the movement of fluid from small blood vessels in the lung (alveolar capillaries) into the air spaces. (Ware LB and Matthay MA, Acute pulmonary edema, *New England Journal of Medicine*; 2005;353: 2788-2796). Pulmonary edema can be caused by increased hydrostatic pressure and congestion in capillaries as the result of fluid back-up in the lungs resulting from a failing heart (cardiogenic pulmonary

edema). It can also be the result of a variety of chemical, infectious, or physical insults to the lung, such as inhalation of toxic gas or reaction to intravenous contrast media used by radiologists (non-cardiogenic pulmonary edema). Pulmonary edema is considered acute when it develops suddenly, over a period of seconds or minutes, rather than hours or days.

13. Pulmonary edema has a variety of effects on the body. First, the presence of fluid in airspaces (alveolar sacs) interferes with normal gas exchange, which reduces the amount of oxygen in the blood. In mild cases, it increases the work of breathing, causing shortness of breath and sometimes coughing or wheezing, and it increases the rate of breathing. As the severity of the pulmonary edema increases, so too does the effort required to breathe, such that the chest muscles and diaphragm strain as they expend greater effort to move air into the lungs. Pulmonary edema produces sensations similar to drowning or asphyxiation as fluid occupies a greater volume of the air spaces. The occurrence of acute pulmonary edema constitutes a medical emergency, and a person who develops this condition while conscious and aware would show signs of increasing difficulty breathing and chest pain, up to and including intolerable sensations and terror associated with drowning and asphyxiation.

14. The presence of pulmonary edema can be confirmed based on information generated during the course of an autopsy:

- a. Pulmonary edema diffusely affects both lungs and results in fluid accumulation in the air spaces and other lung tissues. It is caused by damage to the delicate membranous barrier that separates blood from air spaces creating microscopic gaps that permit the passage of water and other molecules (like protein) into alveoli. This edema fluid is

often clear and yellowish, but if the inciting injury is severe, blood cells may also leak through the damaged membrane, which imparts a reddish color to the fluid (often described as serosanguineous).

- b. Normal adult lungs weigh between 350-400 grams.¹ In cases of pulmonary edema, the weight of the lungs is typically (but not always) markedly increased and they will also be heavy and wet, with cut sections leaking edema fluid and resembling a wet sponge as fluid pours from the tissue when it is squeezed.
- c. Pulmonary edema may result in the presence of foam or froth in the small/lower or large/upper airways (bronchi and trachea), which is the mixture of air, edema fluid, and pulmonary surfactant (a detergent-like secretion normally present in the airspaces). In these cases, foam and froth are visible during the course of an autopsy examination.
- d. Pulmonary edema may also be confirmed using microscopic examination of lung tissue, which reveals the presence of edema fluid.

B. Oklahoma's Execution Protocol

15. I have been advised that the State of Oklahoma intends to execute condemned prisoners using the three-drug protocol stated in Chart D of Attachment D to the Execution Protocol. The protocol provides for the intravenous administration of 500 milligrams of midazolam, followed by 100 milligrams of vecuronium bromide and 120 milliequivalents of potassium chloride.

16. Midazolam is a benzodiazepine drug that in application is highly acidic

¹ Typically, the right lung is heavier than the left lung, both in healthy adults and pathologic states, but developmental variations leading to the reverse are occasionally seen.

because hydrochloric acid is added to maintain the drug in solution. The pH of midazolam is typically 3.0-3.6 (normal body pH is 7.4). Intravenous injection of large amounts of acid solutions, like midazolam, is known to produce acute lung injury with pulmonary edema in animal models (Ikram U et al. Intravascular infusion of acid promotes intrapulmonary inducible nitric oxide synthase activity and impairs blood oxygenation in rats. *Critical Care Medicine* 2003; 31: 1454-1460; Pedoto A, Caruso JE, et al. Acidosis stimulates nitric oxide production and lung damage in rats. *Am J Respir Crit Care Med*. 1999; 159(2): 397-402.).

17. Under Oklahoma's three-drug protocol, midazolam is administered as the first drug with the intention of rendering the prisoner insensate prior to the administration of vecuronium bromide and potassium chloride.

18. Vecuronium bromide is a neuromuscular blocking agent that paralyzes all skeletal muscles, including the diaphragm. Potassium chloride is a naturally occurring mineral salt that, when administered intravenously, causes intense burning pain and, in a large enough dose, will stop electrical activity in the heart and therefore stop the heart from beating. It is my understanding that vecuronium bromide is administered to paralyze the prisoner and suppress respiration, and potassium chloride is administered to induce cardiac arrest and cause death.

C. Executions Using Midazolam: Autopsy Findings

19. I have reviewed the autopsy reports for 32 executions involving the use of midazolam (including one autopsy I personally performed) to determine if there was gross (visible to the naked eye) or microscopic evidence demonstrating the onset of acute pulmonary edema during the execution. Anatomic evidence from the autopsies demonstrates that vast majority (and possibly all) of the prisoners executed using

midazolam developed pulmonary edema and that the pulmonary edema occurred immediately following administration of the midazolam.

20. The presence of froth in the airways is a critical observation in many of the reports because it confirms the occurrence of pulmonary edema after the administration of midazolam but prior to the onset of the paralytic drug (i.e. the second drug). Respiration is necessary for the production of foam and froth in the lungs and airways. That will not occur after the onset of the paralytic because, as noted above, the paralytic will quickly cause the cessation of respiration.

21. I also reviewed eyewitness accounts for all but two of the 32 executions. Although my opinions are principally based on my analysis of the data derived from the autopsy reports, it is worth noting that several of the execution witnesses observed prisoners exhibiting movements and behaviors consistent with serious respiratory distress after the administration of midazolam but before the administration of a paralytic. These observations are consistent with, and in my opinion further confirm, the onset of pulmonary edema. Pathologic observations related to the autopsy findings in the lungs were lifted verbatim from the autopsy reports.

22. **Thomas Arthur (05/26/2017, Alabama, 3-drug midazolam protocol).** Arthur's autopsy report notes his right lung weighed 598 g, and his left lung weighed 470 g. The report documents that both lungs showed moderately congested parenchyma, (the tissue in the lungs involved in gas transfer including the alveoli, alveolar ducts and respiratory bronchioles), and oozed moderate amounts of yellow-tinged frothy fluid. The autopsy findings demonstrate that Arthur developed acute pulmonary edema during his execution. The autopsy report is attached as Exhibit 3.

23. **Oscar Bolin, Jr. (01/07/2016, Florida, 3-drug midazolam protocol).**

Bolin's autopsy report notes his right lung weighed 555 g, and his left lung weighed 680 g. The report notes that both lungs displayed increased firmness, decreased crepittance, and that both were heavy, with congestion and edema fluid. The autopsy findings demonstrate that Bolin developed acute pulmonary edema during his execution. The autopsy report is attached as Exhibit 4.

24. **Christopher Brooks (01/21/2016, Alabama, 3-drug midazolam protocol).**

Brooks's autopsy report notes that his right lung weighed 1020 g, while his left lung weighed 870 g. The report notes that the major bronchi contained froth, with the lungs oozing large amounts of yellow-tinged frothy fluid. The autopsy findings demonstrate that Brooks developed acute pulmonary edema during his execution. The autopsy report is attached as Exhibit 5.

25. **Juan Chavez (02/12/2014, Florida, 3-drug midazolam protocol).**

Chavez's autopsy report notes that his right lung weighed 900 g, while his left lung weighed 880 g. The report notes frothy red fluid oozing from the surface of each lung on manual compression and acute pulmonary congestion and edema fluid upon microscopic examination. The autopsy findings demonstrate that Chavez developed acute pulmonary edema during his execution. The autopsy report is attached as Exhibit 6.

26. **Jerry Correll (10/29/2015, Florida, 3-drug midazolam protocol).**

Correll's autopsy report notes that his right lung weighed 610 g, while his left lung weighed 565 g. The report also notes increased firmness, decreased crepittance, and nonspecific congestion in each lung. The autopsy data is insufficient for me to definitively conclude that Correll developed acute pulmonary edema during his execution, but it cannot be

excluded. The autopsy report is attached as Exhibit 7.

27. **Eddie Davis (07/10/2014, Florida, 3-drug midazolam protocol).** Davis's autopsy report notes that his right lung weighed 1120 g, while his left lung weighed 965 g. The report also notes that both lungs oozed froth with slight manual compression, and both showed marked congestion. The autopsy findings demonstrate that Davis developed acute pulmonary edema during his execution. The autopsy report is attached as Exhibit 8.

28. **Michael Eggers (03/15/2018, Alabama, 3-drug midazolam protocol).** Eggers's autopsy report notes that his right lung weighed 1150 g, while his left lung weighed 910 g. The report also notes that his upper airways contained blood-tinged frothy edema fluid, and that lung tissue and intra-pulmonary airways showed blood-tinged edema fluid. The autopsy findings demonstrate that Eggers developed acute pulmonary edema during his execution. The autopsy report is attached as Exhibit 9.

29. **Ricky Gray (01/18/2017, Virginia, 3-drug midazolam protocol).** Gray's autopsy report notes that his right lung weighed 886 g, while his left lung weighed 715 g. The report also notes foamy liquid in Gray's upper airways. Microscopic inspection revealed edema fluid and blood in the air sacs. The autopsy findings demonstrate that Gray developed acute pulmonary edema during his execution. The autopsy report is attached as Exhibit 10.

30. **William Happ (10/15/2013, Florida, 3-drug midazolam protocol).** Happ's autopsy report notes that his right lung weighed 985 g, while his left lung weighed 825 g. Both lungs were noted to express bloody froth with slight manual compression. The autopsy findings demonstrate that Happ developed acute pulmonary edema during his execution. The autopsy report is attached as Exhibit 11.

31. **Robert Hendrix (04/23/2014, Florida, 3-drug midazolam protocol).**

Hendrix's autopsy report notes that his right lung weighed 750 g, while his left lung weighed 595 g. The report also notes that both lungs oozed bloody froth with slight manual compression. The autopsy findings demonstrate that Hendrix developed acute pulmonary edema during his execution. The autopsy report is attached as Exhibit 12.

32. **John Henry (06/18/2014, Florida, 3-drug midazolam protocol).** Henry's

autopsy report notes that his right lung weighed 735 g, while his left lung weighed 720 g. It also notes that both lungs presented with increased firmness and decreased crepitance, and both showed acute congestion and edema fluid. The autopsy findings demonstrate that Henry developed acute pulmonary edema during his execution. The autopsy report is attached as Exhibit 13.

33. **Robert Henry (03/20/2014, Florida, 3-drug midazolam protocol).**

Henry's autopsy report notes that his right lung weighed 815 g, while his left lung weighed 775 g. The report also notes that sectioned surfaces from both lungs oozed blood and frothy fluid. The autopsy findings demonstrate that Henry developed acute pulmonary edema during his execution. The autopsy report is attached as Exhibit 14.

34. **Paul Howell (03/26/2014, Florida, 3-drug midazolam protocol).**

Howell's autopsy report notes that his right lung weighed 760 g, while his left lung weighed 545 g. The report further notes that Howell's tracheobronchial tree showed pink-tinged froth, and that frothy fluid oozed from both lung surfaces on compression. Microscopic inspection also revealed acute pulmonary edema and congestion. The autopsy findings demonstrate that Howell developed acute pulmonary edema during his execution. The autopsy report is attached as Exhibit 15.

35. **Donnie Johnson (5/16/2019, Tennessee, 3-drug midazolam protocol).**

Johnson's autopsy report notes a right lung weight of 830 g and left lung weight of 800 g. The report also indicates that the lungs showed congestion and edema with frothy fluid in the airways. The autopsy findings demonstrate that Johnson developed acute pulmonary edema during his execution. The autopsy report is attached as Exhibit 16.

36. **Jack Jones, Jr. (04/24/2017, Arkansas, 3-drug midazolam protocol).**

Jones's autopsy report notes that his right lung weighed 835 g, while his left lung weighed 735 g. The report also documents mild diffuse edematous change (presence of edema) in both lungs. The autopsy findings demonstrate that Jones developed acute pulmonary edema during his execution. The autopsy report is attached as Exhibit 17.

37. **Darius Kimbrough (11/12/2013, Florida, 3-drug midazolam protocol).**

Kimbrough's autopsy report notes that his right lung weighed 860 g, while his left lung weighed 590 g and documents slight congestion in each lung. Further microscopic inspection revealed marked vascular congestion and mild alveolar edema. The autopsy findings demonstrate that Kimbrough developed acute pulmonary edema during his execution. The autopsy report is attached as Exhibit 18.

38. **Johnny Kormondy (01/15/2015, Florida, 3-drug midazolam protocol).**

The autopsy report notes Kormondy's right lung weighed 840 g, while his left lung weighed 620 g. Both lungs are noted to be congested, edematous and to ooze frothy red fluid. The autopsy findings demonstrate that Kormondy developed acute pulmonary edema during his execution. The autopsy report is attached as Exhibit 19.

18. **Ledell Lee (04/20/2018, Arkansas, 3-drug midazolam protocol)**

39. Lee's autopsy report notes that his right lung weighed 755 g, while his left

lung weighed 660 g and that both lungs expressed white frothy fluid on compression. The autopsy findings demonstrate that Lee developed acute pulmonary edema during his execution. The autopsy report is attached as Exhibit 20.

40. **Clayton Lockett (04/29/2014, Oklahoma, 3-drug midazolam protocol).**

Lockett's autopsy report notes that his right lung weighed 740 g, while his left lung weighed 580 g and documents edema fluid in both lungs. Further microscopic inspection confirmed pulmonary edema. The autopsy findings demonstrate that Lockett developed acute pulmonary edema during his execution. The autopsy report is attached as Exhibit 21.

41. **Torrey McNabb (10/19/2017, Alabama, 3-drug midazolam protocol).**

McNabb's autopsy report notes that his right lung weighed 430 g, while his left lung weighed 600 g. The report also noted that major bronchi contained froth, and also noted moderately congested parenchyma. The autopsy findings demonstrate that McNabb developed acute pulmonary edema during his execution. The autopsy report is attached as Exhibit 22.

42. **Robert Melson (06/08/2017, Alabama, 3-drug midazolam protocol).**

Melson's autopsy report notes that his right lung weighed 680 g, while his left lung weighed 540 g. The report also documents mild vascular congestion and normal crepitus in both lungs. The autopsy data is insufficient for me to definitively conclude that Melson developed acute pulmonary edema during his execution, but it cannot be excluded. The autopsy report is attached as Exhibit 23.

43. **Walter Moody (04/19/2018, Alabama, 3-drug midazolam protocol).**

Moody's autopsy report notes that his right lung weighed 780 g, while his left lung weighed 980 g. The report further documents congestion in both lungs, and microscopic

examination revealed mild interstitial anthracosis (dust particles). The autopsy data is insufficient for me to definitively conclude that Moody developed acute pulmonary edema, but it cannot be excluded. The autopsy report is attached as 24.

44. **William Morva (07/06/2017, Virginia, 3-drug midazolam protocol).** Morva's autopsy report notes that his right lung weighed 800 g, while his left lung weighed 628 g. The report also documents that Morva's upper airway was filled with a moderate amount of froth. The autopsy findings demonstrate that Morva developed acute pulmonary edema during his execution. The autopsy report is attached as Exhibit 25.

45. **Christopher Price (5/30/2019, Alabama, 3-drug midazolam protocol).** Price's autopsy report documents right and left lung weights of 580 g and 470 g, respectively. The report also notes the presence of blood-tinged frothy edema fluid in the upper airways and describes sectioned surfaces of lungs exuding blood and blood-tinged frothy edema fluid. The autopsy findings demonstrate that Price developed acute pulmonary edema during the execution. The autopsy report is attached as Exhibit 26.

46. **Domineque Ray (2/7/2019, Alabama, 3-drug midazolam protocol).** Ray's autopsy report documents right and left lung weights of 500 g and 430 g, respectively. The lungs are described as showing moderately congested parenchyma and oozing small amounts of yellow-tinged frothy fluid. The autopsy findings demonstrate that Ray developed acute pulmonary edema during the execution. The autopsy report is attached as Exhibit 27.

47. **Michael Samra (5/16/2019, Alabama, 3-drug midazolam protocol).** The autopsy report documents right and left lung weights of 630 g and 620 g, respectively. Lungs are described as dark red-blue and congested. The autopsy data is insufficient for

me to definitively conclude that Samra developed acute pulmonary edema during his execution, but it cannot be excluded. The autopsy report is attached as Exhibit 28.

48. **Ronald Smith (12/08/2016, Alabama, 3-drug midazolam protocol).** Smith's autopsy report noted that his right lung weighed 850 g, while his left lung weighed 920 g. The report further documents congestion in both lungs, and microscopic examination revealed pigmented macrophages and mucus plugs in the bronchioles. The autopsy data is insufficient for me to definitively conclude that Smith developed acute pulmonary edema during his execution, but it cannot be excluded. The autopsy report is attached as Exhibit 29.

49. **Robert Van Hook (07/18/2018, Ohio, 3-drug midazolam protocol).** I conducted an autopsy on Van Hook following his execution. His lungs were heavy (left and right lungs weighing 665 and 709 grams, respectively) and showed grossly evident pulmonary edema with cut sections exuding serosanguineous, frothy fluid. There was bloody froth seen in both main bronchi. The autopsy findings demonstrate that Van Hook developed acute pulmonary edema during his execution. The autopsy report is attached as Exhibit 34.

50. **Charles Warner (01/15/2015, Oklahoma, 3-drug midazolam protocol).** Warner's autopsy report notes that his right and left lungs weighed 550 g. The report also documents that Warner's lungs were both congested and edematous and that both lungs exuded a moderate amount of clear frothy fluid. Further microscopic examination confirmed congestion and edema. The autopsy findings demonstrate that Warner developed acute pulmonary edema during his execution. The autopsy report is attached as Exhibit 30.

51. **Kenneth Williams (04/27/2017, Arkansas, 3-drug midazolam protocol).**

Williams' autopsy report notes that his right lung weighed 590 g, while his left lung weighed 555 g. The report also documents that there was serosanguineous fluid identified in Williams's nares, oral cavity, and upper and lower airways. The autopsy findings demonstrate that Williams developed acute pulmonary edema during his execution. The autopsy report is attached as Exhibit 31.

56. **Marcel Williams (04/24/2017, Arkansas, 3-drug midazolam protocol).**

Williams's autopsy report notes that his right lung weighed 750 g, while his left lung weighed 720 g. The report also documents that there was abundant watery secretion identified in Williams's nares, oral cavity and upper and lower airways. The autopsy findings demonstrate that Williams developed acute pulmonary edema during his execution. The autopsy report is attached was Exhibit 32.

57. **Joseph Wood (07/23/2014, Arizona, 2-drug midazolam and hydromorphone protocol).** Wood's autopsy report notes that his right lung weighed 980 g, while his left lung weighed 945 g. The report further documents that both lungs exuded blood and marked amounts of bloody, frothy fluid. Further microscopic examination revealed that both lungs showed hemorrhagic pulmonary edema. Those autopsy findings demonstrate that Wood developed acute pulmonary edema during his execution. The Autopsy report is attached as Exhibit 33.

D. OPINIONS AND CONCLUSIONS

58. The autopsy data I have reviewed demonstrates that at least 27 of 32 inmates executed according to protocols that include a large dose of midazolam, like the 500 mg dose called for by the Oklahoma protocol, developed acute pulmonary during their

executions.²

59. It is my opinion that the primary cause of the pulmonary edema found in the autopsies of these executed inmates was caused by the IV administration of a large dose of midazolam in a highly acidic form. The midazolam enters the lungs almost immediately after injection and promptly begins to destroy the delicate blood vessels in the lungs, thereby damaging the lungs and causing them to immediately begin to fill with fluid and blood.


60. It is my opinion that inmates executed according to Oklahoma's protocol will develop acute pulmonary edema beginning immediately upon the initial injection of midazolam.

61. It is my opinion that acute pulmonary edema causes intolerable sensations of asphyxiation and causes significant suffering as the person struggles to breathe without being able to inflate the lungs due to abnormal fluid accumulation.

62. It is my opinion that unless rendered insensate by a drug that either deeply depresses brain function or otherwise prevents perception of pain and suffering, inmates subjected to a 500 mg intravenous injection of midazolam will experience severe respiratory distress with associated sensations of drowning and asphyxiation.

63. I understand that discovery remains ongoing, and I reserve the right to amend or supplement my report upon provision of additional information that so warrants, including but not limited to deposition testimony and additional documents.

² In the other five reports, pulmonary edema was not documented. However, the absence of such documentation does not necessarily mean those inmates did not develop pulmonary edema. Macroscopic evidence of pulmonary edema can easily be overlooked if not specifically sought. It is my opinion that those other executed inmates may have developed pulmonary edema that may have been identified in a microscopic examination.



Dr. Mark Edgar M.D.

1/29/2021
Date